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ASSESSMENT OF COMPOSTING FEASIBILITY AT ARMY INSTALLATIONS

PURPOSE

The purpose of this assessment was to evaluate various types of composting operations to determine their technical and economic feasibility at Army installations. The assessment included site visits to two installations with dissimilar compost programs. Another objective was to determine how USACHPPM could assist Army installations in developing compost programs.

WHY COMPOSTING?

Composting of organic materials from the solid waste stream not only provides a valuable benefit to nutrient deficient soils, it greatly reduces the amount of waste disposed in landfills or incinerators. Other benefits of composting organic matter include the suppression of certain plant diseases, the reduced need for fertilizers and pesticides, the prevention of soil erosion and nutrient run-off, and assistance in land reclamation projects. The compost facility provides a safe area to dispose of leaves and wood debris without incurring the risks of uncontrolled waste piles accumulating throughout the installation. A ready supply of finished mulch and leaf compost is available to tenants cost-free throughout the year and in quantities that are often unavailable from outside contractors. There is also a monetary incentive to the installation and the tenant, and composting helps to bring the installation in compliance with regulatory rules for waste reduction goals.

BENEFICIAL USES OF COMPOST MATERIAL

Turf Remediation and Landscaping

Compost has been viewed as a valuable soil amendment for centuries. Most people are aware that the use of compost is an effective way to improve plant growth. Compost-enriched soil can also reduce erosion and nutrient run-off, alleviate soil compaction, and help control pest infestation in plants. This can reduce the use of chemical fertilizers, increase healthy plant production, save money, and conserve natural resources.

Disease Control for Plants and Animals

Users are discovering that compost enriched soil can also help suppress diseases and ward off pests. It destroys disease organisms and creates a nutrient-rich product that can be used or sold. These beneficial uses of compost save revenue, reduce the use of pesticides, and help conserve natural resources.

Soil Remediation

A new compost technology, known as compost bioremediation, is currently being used to restore contaminated soils, manage storm water, control odors, and degrade volatile organic compounds.

Soil at more than 30 munitions sites across the United States is contaminated with explosives. The U.S. military has discovered that composting can be effectively used to remediate this soil. Through this process, contaminated soil is excavated, mixed with other feedstocks, and composted. The end product is a contaminant-free humus that can enhance landscaping and horticultural applications. Composting costs considerably less than soil excavation and incineration, the traditional method used for these clean-ups.

Reforestation, Wetlands Restoration, and Habitat Revitalization

Native plants inhabiting our countrysides provide food for nearly every other member of the habitat. As plants die, they continue to support grasses, flowers, and trees by becoming the humus. Original wetland plants can be restored with the use of compost during planting. Compost provides tree seedlings with added rigor for survival and growth.

COMPOSTING FEEDSTOCKS

Feedstocks are the materials coming onto a composting site that will serve as the main ingredients in the compost recipe. Examples of feedstocks used at Army installations are leaves, tree-trimmings, waste wood such as pallets, and dewatered sewage sludge. Effective feedstock management needs to be a critical part of any composting facility's operational plan. Improperly managed feedstocks can be a significant source of odor concerns and can negatively affect the quality of the finished compost product.

Organic feedstock material is biologically active and populated with a variety of microorganisms. These microbes have already begun the process of breaking down the material. As in actively composting mixtures, microorganisms that require oxygen to function (called aerobic microorganisms) will break down organic material to produce odorless carbon dioxide and water vapor. If a feedstock is wet and heavy or compacted so that air cannot infiltrate into mass, microorganisms that require oxygen to function (anaerobic microorganisms) will become the dominant decomposers. These are the microbes that generate strong, objectionable-smelling gases. To avoid the production of gases, the organic material needs to be maintained in an aerobic state from the time it enters the composting facility.

Feedstock screening, separation (manual), magnetic separation and eddy-current machines (for removal of nonferrous metal) are examples of effective techniques for separating hazardous and noncompostable materials.

A proactive materials management plan that extends to feedstocks will help the facility's operator to capitalize on the potential benefits each feedstock can contribute to the final compost mix.

COMPOSTING METHODS

Grasscycling

If you have a lawn, you can reduce the amount of waste generated by recycling grass clippings in place. Just "mow and go." Grass clippings are 90% water and decompose quickly releasing nutrients to the lawn. In fact, if grass clippings are left to decompose on your lawn, the nitrogen added to the soil equals 1-2 fertilizations per year. Grasscycling means less work: no shopping for bags, no bagging, no hauling bags to the street (or to the compost bin), and less fertilizer purchased and applied. Grasscycling also contributes to waste reduction if being diverted from a landfill.

Backyard Composting

Backyard composting is the most practical and cost-effective method for managing yard wastes and some food wastes from single-family housing areas. It eliminates the need for specialized collection systems (vehicles) and centralized composting facilities. It also provides a valuable product that can enhance the soil and increase the growth and health of the yard or garden. This type of program is limited only by the motivation of the residents and resourcefulness of the program administrators. Table 1 lists materials that are normally suitable for backyard composting and those materials that are normally unsuitable

Factors that limit or preclude backyard composting include: lack of command support, lack of space in yards, resistance from residents, and the low percentage of residents in single-family housing.

Table 1. Materials to Use or Exclude from Backyard Composting.

Materials Suitable for Backyard Composting	Materials UnSuitable for Backyard Composting
Plants, weeds, grass	Bones
Bread, coffee grounds and filters, egg shells	Pet manures (e.g., dog or cat)
Farm animal manures	Dairy products
Garden trimmings	Diseased plants
Leaves	Meat scraps
Straw	Mayonnaise, salad dressing, cooking oils, lard
Soiled or nonrecyclable paper (shredded)	Noxious weeds including poison ivy and nightshade
Wood chips, twigs, shredded branches, and sawdust	Weeds that have gone to seed
Fruit and vegetable scraps	

Windrow Method

The common feedstock for this composting method includes leaves, grass, brush, and tree trimmings. Leaves, grass, and brush are collected for composting via several different techniques. The selection of the correct composting method depends on the type of material to compost, the amount of land area available, climate, and the available budget. At these sites, the compostable material is taken to a central location. There, it is typically processed in aerated windrows where organics are formed into rows or long piles. Some sites will add compostable municipal solid waste (MSW) to the mix for reducing landfilled and\or incinerated solid waste. The finished compost can be sold or given away for use in gardening and landscaping.

Turned windrow is the most common method for rapid composting. A windrow is an elongated pile that can be several hundred feet in length. Mixing and aeration are accomplished by mechanically turning the windrow. Turning frequency is the major means of process control in windrow composting for producing a more uniform quality compost in less time. Finished compost can be made in as little as 3 months, or as much as 2 years, depending on the type of waste and temperatures, as well as turning frequency. Preshredding leaves can accelerate composting and may be necessary where a large amount of waste needs to be processed on a small site.

Aerated Static Pile Method

Forced aeration accomplishes decomposition by a network of perforated plastic pipes under the pile through which air is blown. This is a more expensive process than a mechanically turned windrow. It is most commonly used for composting sludge or food processing wastes where aeration and temperature control are crucial. Forced aeration requires a bulking agent to balance the carbon to nitrogen ratios, absorb moisture, and increase the porosity for aeration. Yard waste can be a cost-effective substitute for standard bulking agents such as sawdust or wood chips. For a community considering co-composting yard waste with sludge, a forced aeration system can be an economical way to handle the combined wastes.

In-Vessel Systems

These systems take raw wastes and place them in a completely enclosed system with built-in aeration and mechanical mixing equipment. This offers protection from severe weather and better odor control than other methods, however, the system is expensive to build and operate. Because of the cost involved ($40 to $150 per wet ton of waste), this method is best suited for programs that compost yard waste with sludge (as is the case at Fort Irwin), food processing waste, mixed solid waste or other difficult-to-manage materials. For a description of Fort Irwin's Ag-Bag in-vessel system refer to Case Study #2, Description of Operation.

Mixed Waste Composting

Composting of mixed MSW is another option. Mixed waste composting facilities separate MSW into component streams for composting, recycling, and refuse disposal. Mixed MSW composting generally occurs at medium-to-large scale facilities operated by private sector firms or public works departments. Mixed solid waste is received at the site where recyclables, such as glass and aluminum and noncompostables, are removed early in the process. The remaining organic material is composted generally using aerated windrows. In-vessel composting, where the material is left to decompose while enclosed in a temperature and moisture controlled device, is another possibility. Final screening steps remove any remaining plastic and similar contents.

Biosolids Composting

The U.S. Environmental Protection Agency (EPA) endorses the composting of biosolids (sewage sludge) as a way of managing this material. The agency characterizes biosolids composting and offers guidance and technical assistance through the Office of Wastewater Management within EPA's Office of Water.

SUMMARY OF COMPOST METHODS AND CONDITIONS

Table 2 provides some basic information about the composting methods described above that can be used to make a quick comparison. Table 3 shows the favorable physical and chemical characteristics of active compost.

Table 2. Summary of Compost Methods.

Method	Land Area Required	Advantages	Disadvantages
Grasscycling	Dependent on lot size	Rapid degradation, no cost, enhances soil, saves landfill space	None
Backyard composting	Small area	Direct control, simple and effective for residents, saves landfill space, recycled at point of origin	Potential odor and vectors, dependent on knowledge of resident
Turned windrow	Large area, for material and equipment	Simple and effective for wide range of materials: large or small scale	Requires State permit, heavy machinery, monitoring
Aerated windrow	Moderate area, less intensive material handling	Direct odor control, parameters electronically monitored and controlled	Expense, complexity of control equipment, not for very large scale
In-vessel	Small area, concrete pad required	Odors and vectors controlled, may not require State permit, fast compost times, no run-off, no earthwork for site preparation	Complex, specialized equipment required, potential high capital cost

Table 3. Summary of Favorable Composting Conditions.

Condition	Preferred Range
Carbon to Nitrogen ratio (C:N)	25:1 to 30:1
Moisture content	50 to 60 %
Oxygen concentration	>5%; high as possible
Particle size	Should contain a mix of sizes, from very small to 2-3 in.
pH	6.5 to 8.0
Temperature	130 to 140 F

CASE STUDY #1 - FORT BELVOIR, VIRGINIA

Description of Operation

The Yard Waste Compost Facility at Fort Belvoir has been actively managed since October 1997. The facility is open from October to February every weekday 0730 to 1600, and from February to September each Wednesday from 0730 to 1600. The facility is open five days a week October through February, due to the fact that almost half of all material is handled during the first quarter of the fiscal year, with the busiest months being November and December.

The compost facility accepts drop-offs of yard debris from post residents during operating hours to include vacuumed and bagged leaves collected primarily during November and December. The residents may also bundle yard waste for special pickup by a facilities maintenance contractor who delivers the pickups to the facility throughout the week. Also, a tree service company regularly drops off wood chips at the facility.

Wood debris is ground into wood chips with a tub grinder and windrowed. The windrowed wood chips are monitored for proper moisture and temperature and allowed to compost until a dark brown color is achieved. At this time the wood chip mulch is ready to use.

Leaves are also run through the tub grinder, arranged in windrows and monitored for proper moisture and temperature. The windrows are periodically turned with a windrow turner to accelerate degradation. The use of heavy equipment maintains an aerobic environment in the piles that helps to break down the leaves and thus increases the surface area. The leaves are allowed to compost until no traces of stems or leaf structure remain. At the end of the composting process, the leaves are reduced to nearly half of their original volume.

A detailed breakdown of fiscal year 2002 (FY 02) incoming materials and outgoing commodities is presented in Table 4. The breakdown is assembled from monthly reports, weight tickets, service orders, and observed by Environmental and Natural Resources Division (ENRD) staff and contractors. Outgoing material is transferred from the compost facility to the 21st Street

Table 4. Fiscal Year 2002 Economic Analysis.

	Volume/weight	Commercial cost	Cost breakdown
Wood Chip Mulch	1950 cubic yards	$30.00/cubic yard	$58,500
Compost	446 cubic yards	$39.21/cubic yard	$17,488
Disposal Cost Avoidance	1368 tons	$28.00 transport and disposal	$38,304
Gross Savings			$114,292
Estimated Operating Expenses			($100,000)
Net savings			**$14,292**

collection point in large quantities. It is then distributed through a service order in smaller quantities. Incoming wood chips are usually fairly evenly distributed throughout the year, but in FY 02 a large influx was received during the first quarter due to inclement weather downing trees and branches in the developed areas of the post. Leaves are brought into the facility primarily in October, November, and December. Depending on the prevailing weather conditions during the growing season, leaf season has been skewed by as much as a month from year to year.

Calculating incoming brush quantities was complicated because the feedstock is delivered irregularly from a number of sources tending to be commingled with trash and other large bulky items. In contrast to previous years, brush is no longer estimated on a monthly basis but is assumed at 200 cubic yards per month based on observations in FY 98 through FY 01.

Economic Evaluation

A financial analysis of the disposal cost avoidance and the value of products produced by the compost facility is presented in Table 5. Three local vendors were contacted for prices on comparable mulch and compost products. The lowest prices available for products of comparable quality were used in the analysis. Most vendors offered bulk discounts and free delivery on large quantities, but not all vendors could assure a supply in quantities typically used for Fort Belvoir service orders throughout the year. The lowest price for leaf compost was $39.21 per cubic yard delivered, while charges for wood chip mulch were $30.00 per cubic yard with a lower price for bulk quantities and free delivery.

Commercial costs are estimated based on prevailing local rates, including delivery charges for the indicated commodities. Costs are based on the lowest rates likely to be widely obtainable during the times of the year demand is greatest. Reduced unit costs and free delivery of wood chip mulch is common in the region for larger quantities, but for compost costs were found to be more stable. It should be noted that many private suppliers would be unable to supply Fort Belvoir's compost and mulch requirements during the high-demand spring months. This would likely result in higher unit costs to Fort Belvoir should the installation procure materials locally in future years. Disposal costs are based on transport to the I-95 complex at Lorton, Virginia with a cost of $28.00 per ton. In FY 98-99, calculations were based on $53.75 per ton to the Middle Peninsula Landfill which was the destination for Fort Belvoir's solid waste during those years.

Table 5. Breakdown of Cost Savings/Avoidance and Operating Expenses – FY 98-FY 02

	FY 98	FY 99	FY 00	FY 01	FY 02	Total
Wood Chip Mulch	$70,760	$50,420	$30,880	$49,420	$58,500	$259,980
Compost	$20,953	$78,518	$90,335	$32,915	$17,488	$240,209
Disposal Cost Avoidance	$55,134	$74,175	$36,176	$28,672	$38,304	$232,461
Gross Savings	$119,153	$197,910	$157,391	$111,007	$114,292	$727,447
Estimated Operating Expenses	($82,775)	($96,473)	($100,000)	($100,000)	($100,000)	($479,228)
Net Savings	$64,092	$101,437	$57,391	$11,007	$14,292	**$248,219**

Regulatory Requirements

The Fort Belvoir compost facility is managed in accordance with the Commonwealth of Virginia Vegetative Waste Management and Yard Waste Composting Operations and subject to Chapter 101 of the Solid Waste Management Regulations, 9 VAC 20-101-10 et seq. Fort Belvoir's compost facility, which initiated operations during October 1997, is considered exempt from the regulation under 9 VAC 20-101-60, which states: "Owners or operators of agricultural operations who compost only the vegetative wastes and yard waste generated on said property shall be exempt from all other provisions of this chapter and from all requirements of the Solid Waste Management Regulations, (9 VAC 20-101-10 et seq.) as applied to the composting activity." The Fort Belvoir Yard Waste Compost Facility complies with the conditions cited in 9 VAC 20-101-60(c), because it neither accepts vegetative waste from outside Fort Belvoir nor does it distribute finished products outside Fort Belvoir.

Strengths and Weaknesses

Beneficial Uses of Finished Compost.

Wood chip mulch has been used widely throughout the post. Its primary use has been to mulch around trees and planting beds in housing areas by post residents and in commons areas in the vicinity of Billeting and Dyncorp. Lesser quantities of mulch are supplied to refuge areas, trails, ball fields, and the Old Guard. Contractors that received mulch were subcontractors to Dyncorp or directly contracted through DIS-ENRD. Post residents and Billeting used leaf compost to build up soil in flowerbeds and vegetable gardens. Large quantities of leaf compost are used to enhance soil conditions around large, mature trees in unimproved areas. Excess quantities of compost, periodically accumulated, can be used for large reforestation projects and for erosion control and beautification of golf courses. Most residential use is observed to occur in the spring, however, the application of compost to gardens and landscapes when accomplished in the fall can be particularly beneficial.

Nuisance Contaminants.

Common contaminants in the feedstock include plastic bags, containers and objects (tools, toys, plastic strapping, shrink wrap, and other miscellaneous items), aluminum cans, cloth, and styrofoam. Aluminum, glass bottles, and #1 and #2 plastics are recovered and processed by the recycling center. Dangerous contaminants encountered include glass, metal window casings, railroad ties, engine parts, and pressure-treated and creosote-coated wood. Occasional dumping in the dumpster by individuals not associated with the compost facility and the recycling center has been observed.

Monitoring Quantities.

Calculating the incoming brush quantities has been a problem because of its irregular delivery from a number of sources and its tendency to come in commingled with trash and other large bulky items. The brush-like material also arrives in various forms (i.e., shrubs, branches, trees, or weeds).

Environmental Benefits.

Environmental benefits include solid waste reduction and diversion from costly landfilling and incineration. Resources are conserved through a reasonable supply of compost and mulch for landscaping, beautification, and soil enrichment. Composting also helps suppress plant diseases and pests. In addition, compost facilities are not likely to contaminate ground water as can be the case in landfills.

Economic Benefits.

The compost facility is cost effective. It has generated a net savings to the installation each year since 1997, despite fluctuating solid waste disposal costs. A total savings (cost avoidance) since 1997 is estimated to exceed $248,000. Coordinating with other activities, including maintaining communication with refuge and golf course management, has proven effective in managing product distribution.

CASE STUDY #2 – FORT IRWIN, CALIFORNIA

Method Selection Criteria

Fort Irwin’s composting operations are unique due to the arid conditions found in the Mohave Desert where the installation is situated. Water conservation is an important consideration. Fort Irwin has 48 inches of evaporation and only some 4 inches of precipitation annually. The primary source of water is the ground water underlying the post. Surface water is not readily available. The climate requires the use of a composting system that will retain, as well as reduce, the water needed.

Another physical parameter is the high winds Fort Irwin receives during the majority of the year. In addition to the potential for increasing the evaporation of the composting material, wind can disturb feedstocks and finished compost creating windblown debris that must be cleaned up. The labor costs for cleaning up, watering, turning, and tending required by some composting methods were considerations that Fort Irwin took into account.

In California, composting on a large scale utilizing windrows requires a concrete composting pad with a leachate collecting system. The cost for such a system was considered prohibitive.

Description of Operation

Fort Irwin's in-vessel, AgBag compost system is technology that uses a low-cost containment vessel with forced aeration. This allows for a high degree of process control over the composting matrix. An elongated plastic tube (or POD) 5 or 10 feet in diameter and up to 200 feet long forms the containment vessel. The raw material used as feedstock is placed into the POD through an encapsulator. This technology also includes an aeration system complete with controls. Forced aeration, to maintain an aerobic condition, is provided by supplying air with an electric blower through perforated pipe that runs the length of the POD.

Process monitoring is an adaptation of techniques proven over time from other in-vessel composting systems. The system offers a relatively low-cost solution for composting in arid climates with the advantages of an in-vessel system that provides a high degree of process control.

The aerobic process of this system prevents the generation of obnoxious odors since aeration is done regularly, and aerobic activity is maintained throughout the cycle. The POD provides complete containment and prevents unwanted moisture changes due to drying winds or excess heat. There is no dust generation due to surface drying or the possibility of blowing debris. There is no leachate runoff.

Composting in a compressed state significantly reduces the land area required as opposed to windrow methods that require four to six times more land. A 200 feet long POD, 10 feet in diameter, can contain up to 200 tons of material. This equals approximately 500 cubic yards.

Equipment and Employees

Equipment costs are to be considered in any operation. The AgBag machine is not perfect or inexpensive, however, the cost is much less than a concrete pad and leachate collection system. The few problems with the AgBag machine have been eliminated by operational modifications such as not filling the system too full and paying strict attention to operational procedures.

The Army purchases all heavy equipment, and contractors perform required maintenance. Primary equipment for the Fort Irwin compost facility are a bucket loader with a knuckle boom, a tub grinder, a 15 cubic yard moving bed truck, a stare screen, and an AgBag bagging machine for filling the in-vessel tubes.

Employees are required to sort, segregate, and prepare feedstocks for grinding and treatment prior to developing the in-vessel system. Other tasks include watering, turning, and tending the compost feedstocks. Contractual employees including equipment operators and laborers have received "landfill worker training" and have been vaccinated for Hepatitis B.

Economic Evaluation

The Fort Irwin composting program economic analysis is not currently available. It is in the process of being developed by a new contractor. The installation will forward the data upon receipt.

Regulatory Requirements

AR 420-49 contains policy and criteria for the operation, maintenance, repair, and construction of facilities and systems, and for efficient and economical solid (non-hazardous waste) waste management. Chapter 3 gives general guidance on all aspects of solid waste management including composting (section 3-31).

In addition to State regulations, the EPA has established regulations for composting of sewage sludge under 40 CFR 503, Standards for Use or Disposal of Sewage Sludge. The Federal regulations include guidance for general requirements, pollutant limits, best management practices, operational standards, monitoring, recordkeeping, and reporting.

Strengths and Weaknesses

Operational Benefits.

The in-vessel composting system at Fort Irwin has several strengths including: the prevention of nuisances; reduced site area; rapid composting/reduced cycle time; low maintenance/good process control; flexible operations/durable equipment; and relatively low cost. Dewatered sewage sludge is commingled with other feedstocks successfully within the in-vessel system.

Environmental Benefits.

Environmental benefits include solid waste reduction and diversion from costly landfilling and incineration. Resources are conserved through a reasonable supply of compost and mulch for landscaping, beautification, and soil enrichment. Composting also helps suppress plant diseases and pests, and it can reduce run-off and soil erosion. In addition, compost facilities are not likely to contaminate ground water as can be the case in landfills.

Uses of Finished Compost.

There are limited sources for the use of compost product outside the Fort Irwin cantonment area. The installation's remote location within the Mohave Desert in southern California diminishes the profitability of off-post use.

Climate-Related Advantages.

The in-vessel composting system is well suited to Fort Irwin and its arid environment. The compostable material in the AgBag tubes requires watering only once. Fort Irwin has limited resources for feedstocks owing to only moderate quantities of yard waste and tree trimmings. Miscellaneous wood material including a large quantity of pallets and wooden boxes provide the preponderance of Fort Irwin's feedstock.

Economics.

Fort Irwin's compost program has not been fiscally profitable. However, the installation has met and exceeded several environmental milestones for the management and diversion of solid waste from landfills.

PLANNING FACTORS

In the initial planning stages, make every effort to involve all interested parties. There are a host of regulatory, social, and economic issues that must be addressed. The siting of any type of waste management facility can spark citizenry reactions. The installation would want to be a good neighbor, and it would not want to adversely impact soldiers in any way.

- Determine the goals of the composting program and clearly define the pressures directing the reduction of solid waste. Then, identify who will own and/or operate the compost program and its facilities - the Federal government or a private contractor. Federally owned compost facilities must be sited on the installation, preferably downwind from the cantonment area, and well within installation boundaries.

- Analyze the solid waste streams for what fractions are compostable, where those materials are generated, and what type of collection system will most efficiently gather the highest volume of compostables. The type of waste will have a direct affect on the choice of composting technology.

- Determine who will use the finished compost. In many cases, a built-in market is already established since large troop-based installations are analogous to small cities. The potential compost generation must be compared to the demand. Also, weigh the cost of constructing and implementing composting against landfill diversion and the value of finished compost. Address these types of questions before expending funds on equipment or site design.

USACHPPM'S ROLE IN COMPOSTING AT ARMY INSTALLATIONS

USACHPPM has the expertise and ability to help Army activities, in a variety of climates, establish an efficient composting program for the reduction of solid waste generation and the environmental and economic enhancement of the installation. All installations producing solid waste can benefit from the reduction of solid waste streams and diversion from valuable and costly landfills.

CONCLUSIONS

- Identifying precise objectives, proper planning, and knowledge of the waste stream are needed to select appropriate technology and design features for compost facilities.

- Military installations could decrease their reliance on dwindling landfill space by as much as 50 percent by implementing a compost program.

- Large quantities of yard waste (green waste), selected food wastes, and other organics can be composted in an inexpensive, simple, outdoor windrow system.

- Grasscycling is a simple and natural approach to recycling grass. It saves time (no more bagging), valuable landfill space, and disposal costs, and it enhances the nutrient content of the soil.

- Backyard composting is an extremely practical and cost-effective method for managing yard wastes and some food wastes from single-family housing areas.

- Diversion of compostable municipal solid waste streams from landfills could greatly aid military installations in meeting Federal, state, Army, DOD and local solid waste reduction goals.

- Markets for compost products have a crucial impact on the kind of processing required to prepare the materials for end users.

- USACHPPM has the expertise and ability to help Army activities, in all climates, establish an efficient composting program for the reduction of solid waste generation and the environmental and economic enhancement of the installation.

ACTIONS FOR DEVELOPING A COMPOSTING PROGRAM

- Create a plan for public relations.

- Identify and estimate the type of organic materials or feedstock to be composted.

- Develop a mass balance calculation to consider the capacity of the facility, flow of materials, process operations mixing ratios, quantity of feedstocks, bulking agents, and final product and residuals.

- Identify markets and compost specifications.

- Evaluate technologies. Study factors including cost/funding mechanisms, available area, feedstock types and quantities, proximity to neighbors, operator expertise, existing waste management systems, and regulatory requirements.

- Evaluate the site for zoning and land use, the history of the site, the site's physical features, climatic features and effects, proximity to end users, and access and infrastructure issues.

- Develop a plan for financing facility development and operation.

- Develop an Operations Plan to include the following: a material flow plan; guidelines for the development of a quality compost; air quality control; leachate and storm water management; moisture management; equipment procurement and maintenance; personnel staffing; employee training and refresher training; safety planning; neighbor involvement; fire emergencies management; odor management; vector management; monitoring; sampling/quality assurance; contingency planning; closure planning; inspections; record-keeping; reporting; permitting requirements; applicable Federal, state, Army, DOD, and local regulations; actions to take should ground water become contaminated/and for other releases; and actions for the event of fire or explosion.

- Contact USACHPPM for technical assistance. The contact phone number is DSN 548-2024 or (410) 436-2024.

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